SASKATCHEWAN RESEARCH COUNCIL

33RD ANNUAL REPORT 1979

THE RESEARCH COUNCIL ACT, 1965.
Clause 21, in part, directs that:

1. The Council shall on or before the last day of February in each year submit to the Lieutenant Governor in Council a report of its proceedings and transactions during the next preceding calendar year, which report shall contain such particulars as the Lieutenant Governor in Council may prescribe.

2. Every report shall forthwith be laid before the Legislative Assembly if then in session of, if it is not in session, within fifteen days after the opening of the next session.

Regina, February 22, 1980

TO THE HONOURABLE C. McINTOSH

Lieutenant Governor of the
Province of Saskatchewan

MAY IT PLEASE YOUR HONOUR:

The undersigned presents herewith, for your consideration, the report of the Saskatchewan Research Council for the year ended December 31, 1979.

Respectfully submitted,

Norman Vickar, Chairman
Saskatchewan Research Council

PLEASE ADDRESS CORRESPONDENCE TO:

Saskatchewan Research Council
30 Campus Drive
Saskatoon, Saskatchewan
S7N 0X1

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MEMBERS OF THE SASKATCHEWAN RESEARCH COUNCIL

The Honourable Norman Vickar, Chairman
G. L. Gartner, Vice Chairman
D. Murray (Secretary)
G. Birney
T. S. Burton
E. B. Campbell
B. M. Craig
J. Hutch
J. O. Jonsson
L. Katz
K. J. McCallum
P. Melin
B. Michel
G. C. Mitchell
P. Nikiforuk
B. Thompson
E. B. Tinker
M. Wallace

EXECUTIVE OFFICERS OF THE COUNCIL'S STAFF

Executive Director ..... T. P. Pepper
Administrative Officer ..... R. E. Melvin
Director of Financial Services ..... R. McGrath

Division Heads

Chemistry and Biology ..... E. M. Coxworth
Engineering ..... W. H. W. Husband
Geology ..... R. G. Arnold
Industrial Services ..... A. Scharf
Physics ..... J. Maybank

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PROCEEDINGS OF THE COUNCIL

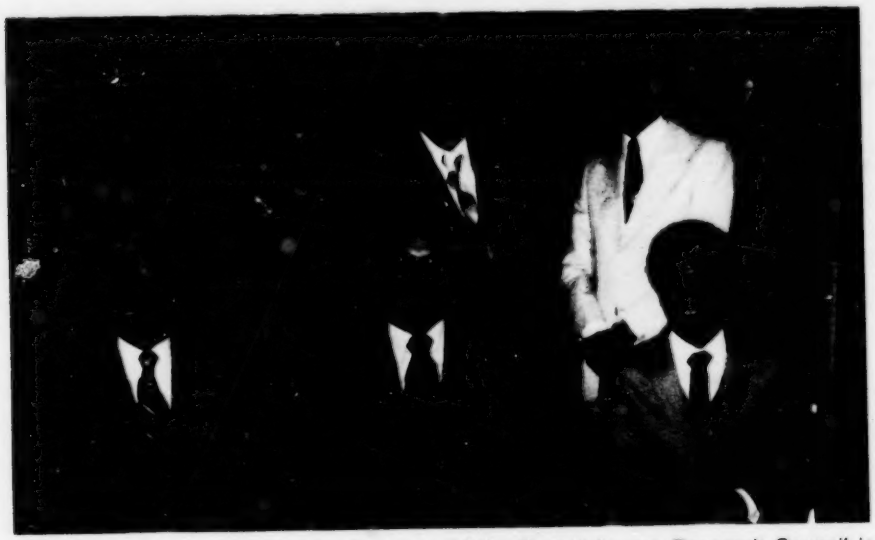
Membership of the Council remained at 18, the maximum number permitted by the SRC Act as revised in 1978.

There were two resignations during the year. R. Lloyd resigned from the Executive Council to become President of the Saskatchewan Mining Development Corporation. E. Spencer resigned from the Department of Agriculture to return to farming. Council extends grateful thanks to these gentlemen for their contribution to Council activities. New members appointed to Council were J. O. Jonsson and M. Wallace.

The Council met three times to date, December 3, 1979: in Regina on April 5, in Saskatoon on July 9, and in Regina on September 5. The main business of these meetings was to receive the reports of the Executive Committee and the Executive Director, to formulate policy and priorities for the program of the laboratories, and, in particular, to consider the future role of the Saskatchewan Research Council.

The Executive Committee so far has met twice during 1979: On April 2 and on June 18. Dr. L. Katz joined Council Officers (i.e. Chairman, Vice-Chairman and Secretary), and Dr. B. Craig as a member of the Executive Committee. The main activities of the Executive Committee were to deal with routine administrative matters of the laboratories and, in collaboration with Council Management, to prepare policy and major administrative program items for Council discussion.

During 1958 Council had struck an Ad Hoc Committee to deal with the "Future Role of the Saskatchewan Research Council." This committee presently consists of D. Murray (Chairman), J. Hutch, L. Katz, and B. Tinker. The Committee, having reviewed the report by Phillip A. Lapp Ltd. on the "Future Role of the Saskatchewan Research Council," together with outside reactions to this report, is now preparing its recommendations in a report to Council.



The Honourable Norman Vickar, Chairman of the Saskatchewan Research Council is shown with members of the Executive Committee. Standing from left to right are Leon Katz, Bert Craig and Derek Murray (Council Secretary). Seated from left to right are Tom Pepper, the Honourable Norman Vickar and Gerry Gartner (Council Vice Chairman).

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INTRODUCTION

A very active year in 1979 has set the stage for SRC to enter the 80's optimistically, and confident it will play an increasingly useful role in applying technology effectively to Saskatchewan's development. The provincial grant increased by 3.2% over 1978 to $2,599,000, and the revenue from fee-for-service work is expected to increase by 12% to over $3,000,000. The number of paying clients is expected to exceed 200 for the first time.

For the second successive year client revenue exceeded the provincial grant. Client revenue provided 52% of total operating funds for the 1978-79 fiscal year, and some 54% during the 1979-80 fiscal year. While there are some signs of this percentage increasing further it is important, in order to ensure that staff and facilities remain adequate to tackle Saskatchewan-wide problems in the 80's, that a reasonable balance be preserved between the grant-supported "Saskatchewan" program and the client-supported fee-for-service program.

Full-time staff increased from 150 in October, 1978, to 174 in October, 1979. Scientific staff increased from 57 to 60, technical staff from 75 to 96, while administrative staff remained unchanged at 18. The dramatic increase in technical staff resulted from the marked expansion in analytical services provided by the Division of Chemistry and Biology and the Division of Geology.

The highlight decision for 1979 was to proceed with a major expansion to meet the needs of Saskatchewan's burgeoning resource industries. A 3,500 square metre Resource Research Facility will be constructed during 1980 in SEDCO's Saskatoon Research Park. This facility will consist of two pilot plants and an analytical facility which will be one of the best in Western Canada. One pilot plant will be a general-purpose pilot plant. AMOK Ltd. will be the first client. The Potash Corporation of Saskatchewan will be a long-term client in the second pilot plant. SRC will provide back-up facilities and pilot plant staff for both operations. The analytical facility will be equipped with sophisticated equipment including a plasma-emission spectrometer and a Slowpoke reactor for neutron activation analysis. This facility will provide a significant part of the technical back-up for the pilot plant operations.

Highlights for this year's work are presented under the following headings:

- Agriculture and Agricultural Processing
- Resource Development
- Industrialization
- Environment
- Services

Members of the Uranium Mine Mission from the People's Republic of China were escorted on a tour of SRC's laboratories by Executive Driector, Dr. T. P. Pepper. SRC provided several interpreters for the group and printed translations in Chinese of material relevant to resource development and environmental investigations.

AGRICULTURE AND AGRICULTURAL PROCESSING

INTRODUCTION

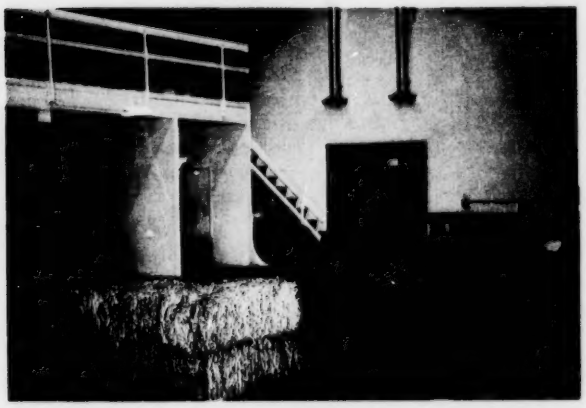
Saskatchewan's economy has remained strongly related to agriculture. Therefore, SRC's research and development program has had a continued emphasis on agriculture and agricultural processing. Much of this work involved co-operation with other people in the federal and provincial governments, the universities, farming and business. Inter-disciplinary studies involved:

- Farm products — new economic uses,
- The agricultural environment,
- Farm water resources,
- Agricultural energy use.

FARM PRODUCTS — NEW ECONOMIC USES

Straw as Cattle Feed

A long range study has continued the investigation of simple, low-cost methods to improve the feeding value of straw for cattle when conventional feeds are scarce or expensive.



The operations of SRC's agricultural projects have been improved immensely by the opening of a laboratory to expedite the processing of crop residues and preparation of samples for analysis.

Ammoniation Process

SRC's investigations have resulted in a field method for farmers in which stacks of straw were treated with ammonia in gas-tight, haystack-sized plastic bags. This year, a laboratory was opened to expedite the processing of crop residues and preparation of samples for analysis.

Cows fed ammonia-treated straws gained more weight than those on other feeds during a maintenance trial conducted at a Saskatchewan Agriculture (SDA) lands branch farm. Other studies have been designed to determine the effects on the ammoniation reaction by the temperature, time and moisture conditions of the straw. Other digestibility studies compared ammoniated straw with steamed straw. Stake Technology in Ottawa and the University of Saskatchewan (U of S) were involved in the project. Findings indicated that steamed straw had a somewhat higher digestibility and intake than ammoniated straw.

Fertilizer Application

Studies have continued, in conjunction with Agriculture Canada, to evaluate the effects of fertilizer on the feeding value of a variety of straws. Findings have indicated that fertilizer application rate affected the feed value of several varieties of straw tested.

Feeding Value for Residues from Unusual Crops

Straw or Forage from New Crops

SRC repeated a study of the feeding values for a wide range of crop residue and forages. The highest values were found for faba bean residue, sunflower residue, Jerusalem artichoke forage, bulrush millet forage and foxtail millet straws, which all had digestibilities similar to alfalfa hays.

Medium quality residues from field peas, *Lathyrus sativus* forage, buckwheat straw and sedge hay had digestibilities superior to barley straw. Ammonia treatment provided the greatest improvement to poor quality residue and forages, although some medium quality hays underwent a moderate digestibility improvement. This study proceeded in co-operation with Agriculture Canada.

New Crop Residue

Feeding trials conducted in cooperation with Agriculture Canada indicated high feed values for faba bean residue and sunflower heads. A cooperative study to continue this investigation is underway in conjunction with SDA, an alfalfa processing plant and Agriculture Canada.

Alfalfa Processing

Investigations continued in the development of alfalfa products for human and animal consumption. These studies involved solvent extraction and enzyme systems designed to remove harmful substances from alfalfa leaf-stem fractions. Leaf-stem separation was done through the cooperation of the POS Pilot Plant Corporation. Dr. James Olson continued the rat feeding studies at the U of S's Home Economics Department. Results indicated that although alfalfa reduced blood cholesterol levels, methods may be needed to remove harmful substances from alfalfa before it can be used to control heart disease.

Agricultural Processing

A new company was formed to set up a facility for the processing and marketing of flax fibre as a direct result of research into this product.

A linen flax feasibility project has produced encouraging results. The project has progressed so well that upon observation of SRC's plots, a visiting Dutch expert indicated that the project seemed very promising.

A new project was developed to introduce long range planning for flax growers in western Canada. The objective of this joint project with SDA is to produce a long term research and development plan for the flax industry.

THE AGRICULTURAL ENVIRONMENT

Chemical Spray Drift

In 1978, an *Air Cushion Sprayer* was tested for its ability to provide more uniform deposit patterns and to reduce off-target droplet-drift. The results indicated that droplet-drift was low, in fact unchanged over a considerable range of wind and tractor speeds. Although the deposit pattern was not quite so good as a standard sprayer, an improved air-cushion model has been designed that may achieve both goals.

In 1979, a new nozzle system was investigated to reduce the application volume without the production of smaller, drift-prone droplets. Furthermore, should the pattern be independent of the application rate, then the new system could enable the farmer to vary tractor speed without affecting deposit uniformity.

An AIR-CUSHION SPRAYER was investigated for its ability to reduce off-target spray drift during pesticide application.

Livestock Pollution

SRC has completed a comprehensive study in cooperation with SDA's Family Farm Improvement Branch (FFIB) to investigate the influence of livestock feedlots and manure disposal areas on the water quality in rivers, creeks and lakes. Water quality data were collected and used to:

- Evaluate the performance of feedlots as sources of pollution;
- Develop simple guidelines to improve the water quality of feedlot runoff;
- Establish a rationale for water quality standards for runoff from agricultural areas.

This study has demonstrated the effect of land use, isolation distance, and the animal density on the quality of feedlot runoff.

FARM WATER RESOURCES

Freeze Desalination

In many parts of Saskatchewan brackish groundwater is the only reliable water source. The unlimited free refrigeration available during a Saskatchewan winter can be used to spray freeze this water and produce potable water for use by humans and livestock.

Spray freezing trials have been done on a number of groundwater types since 1975. This year trials were conducted at Blucher, Frontier and Saskatoon.

Results of these trials show that small communities and farms could satisfy their potable water requirements by spray freezing cheaper than if they used other desalination methods.

Surface Water Management

Differences in topography, land use and climatic regime produce changes in snow cover, soil moisture and water yield from agricultural watersheds.

Detailed hydrologic and climatic data have been collected from 43 large drainage basins in the province and five small SRC watersheds to produce a watershed model. This will provide scientific guidelines for:

- Using snowfences to manage soil moisture,
- Designing and locating dugouts to control runoff,
- Predicting the long term effects of wetland drainage on future water yields.

AGRICULTURAL ENERGY USE

A second year's data were obtained from a dozen farms which used varying energy conservation practices. This project involved the cooperation of the U of S and Agriculture Canada. Conservation information was calculated from energy budgets obtained through controlled experiments which tested and compared specific cropping practices.

A second project investigated farm production of energy fuel through the conversion of biomass or farm waste materials into ethyl or methyl alcohol. Present cropping practices restrict the amount of biomass available for fuel needs. The results of one study indicated that future likely farm practices could increase total yields sufficiently to improve considerably the opportunity for development of farm grown fuel raw materials.

GRANTS-IN-AID FOR AGRICULTURE

SRC extends its research capacity with grants-in-aid for a number of agricultural studies at both Saskatchewan Universities, as reported in the section "University Program." These investigations covered:

- Potato Hybrids Resistant to Frost,
- Stack Gas Heat for Greenhouses,
- Digestibility of Pea Flour,
- Alfalfa to Reduce Cholesterol,
- Saskatchewan Cereals in Foods,
- Microwaves to Control Infestations of Micro-organisms,
- Digestibility of Ammoniated Cereal Straws,
- Swine Floor Temperature Monitor.

AGRICULTURE AND AGRICULTURE PROCESSING

RESOURCE DEVELOPMENT

INTRODUCTION

Research is the lifeline for development of natural resources. SRC's resource identification and development program is directed towards both the discovery of new mineral resources and to the evaluation, development and utilization of known resources. The purpose of this program is to provide technological assistance for the wise utilization of Saskatchewan's natural resources with emphasis on the in-province upgrading of those resources. Along with a particular emphasis of the program on non-renewable resource development in northern Saskatchewan, the environmental effects of future development are being investigated along multidisciplinary lines. Simultaneously, the need has been recognized to develop further the renewable and non-renewable resources in the southern, more densely populated part of the province.

In support of these activities, scientists are developing new procedures and are employing computer models to facilitate economic development.

IDENTIFICATION

Metallogenesis of Uranium Deposits

In an attempt to better understand the factors that played a role in the formation of major uranium deposits in northern Saskatchewan's Athabasca basin, detailed geological, mineralogical and geochemical studies have been conducted during the past few years at the *Rabbit Lake deposit* of Gulf Minerals (Canada) Limited. These studies have continued and broadened this year to include similar investigations at the deposit in Esso Minerals (Canada) Limited, *Midwest Lake* and the *Maurice Bay deposit* of Uranerz Exploration and Mining Company Limited.

The results so far have led to the development of a metallogenetic model that can be useful in exploration for new uranium deposits.

Quaternary Geology

The North

Mineral deposits are often hidden by a cover of glacial overburden. Quaternary geology is the study of the type, distribution, and stratigraphy of the glacial sediments, processes and history of their origin.

Since 1974 Quaternary sediments have been systematically mapped, described, sampled and analyzed on a reconnaissance scale for the Precambrian Shield area of northern Saskatchewan. In 1979, over 40,000 square kilometres were studied in the Black Lake-Wollaston Lake area. This work, coupled with the areas studied previously, completed the mapping of the Quaternary geology on the Shield, an area of approximately 230,000 square kilometres.

Sediment samples were collected in preparation for mapping the Quaternary geology of the Precambrian Shield in northern Saskatchewan. In 1979, 40,000 square kilometres were studied completing a five-year mapping program covering 230,000 square kilometres.

The South

A project has commenced to compile the Quaternary geology of southern Saskatchewan at a scale of 1:1,000,000. This study involved the collation of information on the surficial geology collected in past years. This information is used in geotechnical investigations and planning.

Groundwater

Hydrogeology

SRC's long-standing groundwater program has contributed to the technology of water well development in the province. This work has provided reliable information concerning the location, size, depth and physical properties of aquifers.

For the past two decades, SRC has monitored continuously a network of observation wells. This information was correlated with climatic factors to enable groundwater forecasts based on SRC data. A description of the well network is being published and will be available to the public. Tentative forecasts were prepared for the summer of 1979 based on data gathered during snowmelt.

The series of geology and groundwater maps initiated 19 years ago has concluded with the completion of the Kindersley Map area 72-N. This year, the Saskatchewan Department of Agriculture (SDA) assisted this project through the Family Farm Improvement Branch (FFIB).

A revision of the groundwater map concept was prompted by a steady demand for specific groundwater-related information and the availability of more geological data. Consequently, a new map of the Saskatoon area has been prepared with more extensive information about groundwater quality and quantity.

This year, SRC started a groundwater project in northern Saskatchewan. In order to better understand the flow and chemistry of waters in the Athabasca area, computer digital models were constructed, samples analyzed and geophysical methods were used to define aquifers with geological settings that require a different approach from that used in the south.

Geophysics

Electrical measurements of the conductivity of glacial till were used to detect groundwater seepage. An aim of this study was to reduce factors which endanger fresh groundwater supplies. A paper on seepage detection was presented at an SRC workshop on remote sensing of potash tailings ponds.

Coal Resources

An evaluation program of Saskatchewan's coal resources commenced in 1971. Portions of the study were undertaken by SRC, the Saskatchewan Department of Mineral Resources (DMR) and the Geological Survey of Canada. Over 700 boreholes were drilled throughout the province to provide information about the location and quality of Saskatchewan's coal.

During 1979, Volume I concerning Saskatchewan coal was prepared for publication and funded by the federal Energy, Mines and Resources' (EMR's) CANMET program.

A computer system was developed to facilitate use of the vast amounts of data obtained from this long-range program. This year, copies of these data files were provided to the Geological Survey of Canada. This project has produced computer processable files of chemical data, geophysical data and coal-seam occurrence for the project area in Saskatchewan. SRC has developed and maintained computer accessible files for coal quality assessment data which have been made available to clients on a contractual basis.

DEVELOPMENT

Geochemical Exploration Methods

Gold and Uranium

A geochemical analysis of basal till for gold was the focus of two projects under contract to mining companies.

Portable drilling equipment, provided with a special bit, was used to collect sediment samples over a 60 square kilometre area in La Ronge where rocks of volcanic origin are found. Analyses for gold and associated arsenic were made to obtain information about gold structures which are covered with varying amounts of glacial drift including clay and sand deposits.

A similar study was used to determine controls on uranium and heavy metal distribution in the tills south of the Midwest Lake uranium deposits. This sampling of the glacial overburden was carried out as part of a multidisciplinary research study funded by the Geological Survey of Canada and the Saskatchewan Geological Survey.

The Geochemistry Laboratory provided extensively computerized analyses of rock samples in support of SRC's uranium exploration studies.

Lithogeochemical Research

A project was initiated to investigate host rock alteration patterns in the immediate vicinity of uranium deposits. This lithogeochemical-mineralogical research program was financed jointly by SRC, Asamera Oil Corporation Limited and Esso Minerals Limited. This type of research may expand the size of existing small, deep drill targets identified by uranium mineralization.

Borehole Geophysics

Numerous mining companies have explored for uranium ore by sinking to great depths a large number of boreholes. A probe, sensitive to radioactivity, normally has been run up and down the hole. The uranium content of the deposits can be determined from measurements of the radioactive decay which has occurred within the rock. An accurate assessment of the ore's grade must be determined by precisely calibrated measuring equipment. In order to calibrate their borehole probes, field operators have needed a standard of comparison such as model boreholes with known ore content.

A demand for model boreholes was recognized by SRC in consultation with DMR's Saskatchewan Geological Survey, and mining companies active in northern Saskatchewan. Subsequently, DMR financed the construction of a test facility which used ore provided by Eldorado Nuclear Limited and Key Lake Mining Corporation. Four different uranium ore concentrations were established in testholes which reach total depths of five metres.

Ceramic Research

SRC continued studies which dealt with the utilization of Saskatchewan's raw materials for the production of ceramic products. This research has continued in cooperation with the Saskatchewan Department of Industry and Commerce. The principal study this year was done on Willow Bunch member clays. These clays may furnish raw material for floor and wall tile. Some additional work was done on making hard-to-dry common brick clays capable of easy economic drying through the addition of saline reagents.

The ATHABASCA SAND DUNES are the subject of a multidisciplinary investigation to provide a foundation for predicting the effects of hydrological development upon this unsettled area.

Athabasca Sand Dunes

A multidisciplinary program was conducted in this area which involved geology, surface and groundwater hydrology, plant and animal ecology, archaeology, and climatology. This work was designed to provide basic information about the environment and to determine what effects would occur in the area as a result of changes in hydrological conditions.

Investigations have commenced into the geological and hydrological conditions of the Athabasca Sand Dunes and their development from glaciation to the present. This information can provide a framework in predicting the effects of resource development in this unique and sensitive area. The ecological, archaeological and climatological aspects of this study have been covered in the Environment section of this annual report.

Energy Use and Renewable Supply

An estimate was made of Saskatchewan's current energy end-use in the forms of heat, liquid fuels and electricity, in a study partially financed by DMR. Then, three provincial development scenarios were projected to the year 2025. Assumptions were made about improvements in the efficiency of energy use. End-use energy needs were calculated for that year and compared to estimates of the province's renewable energy supplies. Conclusions drawn from the study indicated that Saskatchewan's renewable energy supplies could sustain a population of between 1.2 and 1.5 million and a greater economic activity than at present provided there were substantial efficiency improvements in energy use through a 20 to 50 percent reduction from the present per capita energy consumption.

GRANTS-IN-AID FOR RESOURCE DEVELOPMENT

SRC has supported some resource development studies at both Saskatchewan universities as reported in the section "University Program". These investigations were concerned with:

- Work Simplification in the Mineral Industry,
- Liquid Fuel from Wood and Straw,
- Disposal of Uranium Mill Tailings,
- Plutons for Nuclear Wastes.

INDUSTRIALIZATION

INTRODUCTION

SRC's role in industrialization is concerned with assisting Saskatchewan's industry through the application of the most appropriate management and engineering technologies. An increase in industrial development can create jobs, replace expensive imports and provide a stabilizing force for Saskatchewan's variable agricultural economy. Therefore, industrialization is an important SRC activity which provides assistance in these areas:

- Management Consulting,
- Product Development,
- Industrial Manufacturing Assistance,
- Physical Process Consultation.

SRC'S PRODUCT DESIGN AND IMPROVEMENT SERVICE fostered a breakthrough in chisel plow design with this Interceptor I. *Under contract for Bush Hog/Melcam, SRC used computer techniques to design a chisel plow of simplified construction with reduced manufacturing and maintenance costs.*

MANAGEMENT CONSULTING

This service provided clients with market research, general management and industrial engineering consulting services. On a contractual basis, the management consulting group provided work which ranged from broad organizational studies to feasibility studies of various kinds. Clients included governments, associations, manufacturing industries and businesses. In response to a continuing heavy demand for management consulting, this group has expanded to five people. During 1979, these consultants provided:

- Feasibility Studies,
- Productivity Reviews,
- Relocation Planning,
- Production Planning and Control,
- Market Research,
- Organization Development Studies,
- Seminars:
  - — Leadership Effectiveness,
  - — Market Planning,
  - — Production Management,
  - — Effective Time Management,
  - — Strategic Planning.

PRODUCT DEVELOPMENT

SRC's *product design and improvement service* provided manufacturers with engineering services in the areas of product testing, value analysis, computer aided product design, and new product development. Twenty-five projects were undertaken this year. Ten projects dealt with new product development and design, three of the projects involved very profitable new products. Another nine projects involved basic improvements to existing products. Six projects involved physical testing of products to evaluate performance and provide specifications for performance.

Product Development Management Program

This year, the Industrial Services Division participated in the *Product Development Management Program (PDMP)* to provide consulting assistance for manufacturers. The program is supported by Industry and Commerce (Saskatchewan) and DESIGN CANADA of Industry, Trade and Commerce (Canada).

PDMP provides a confidential audit of a company's product development potential including recommendations for the company to carry out specific product development projects. The service consists of:

- advice for:
  — product design,
  — marketing,
  — feasibility.
- consulting assistance in areas such as:
  — prototyping,
  — production drawings.

The program has a provision for the establishment of a product development committee within the company to ensure that the project is carried out in the shortest time possible with the highest probability of commercial success.

The first national conference of the people operating PDMP met during October, 1979 at SRC.

Technology Publications

SRC published *Industrial Business Management Technology* for over 4,000 industrial subscribers. This publication is designed to provide broad management know-how for both manufacturers and government. Staff members of the Industrial Services Division wrote articles for this periodical. In addition, *Industrial Business Management Technology* contained reprints of relevant articles selected from almost 100 management publications. Some titles that appeared in 1979 were:

Management by Emphasis,
The High Cost of Leaving,
A Productivity Audit Checklist,
The Modern Marketing Concept,
A Leader Knows: If you win, I win;
Learning About Your Market.

NRC's TECHNICAL INFORMATION SERVICE provided in-plant, production consultation for Zenon Park Industries Limited, a Saskatchewan-based manufacturer of ski-suits and outerwear. An SRC management consultant and TIS assisted this company to expand its operation from Zenon Park into Saskatoon.

INDUSTRIAL MANUFACTURING ASSISTANCE

Technical Information Service

Under an agreement with the National Research Council (NRC), SRC operates a free and confidential *Technical Information Service* for Saskatchewan manufacturers. The service provided help to companies that faced major difficulties. Inquiries were made to the TIS group from both private individuals and industry. TIS provided manufacturers with help in the areas of technical assistance and industrial engineering, welding technology and a student assistance program.

Technical Assistance and Industrial Engineering

In 1979, 430 plant visits were made by the TIS group which provided manufacturers with assistance in areas such as technical process problems, materials, machinery, quality control, product protection, labour, sales, and relocation. This technical assistance was provided by drawing upon the expertise within the SRC, NRC and the University of Saskatchewan. In some cases, clients were referred to other federal and provincial agencies.

Welding Technology

The Canadian Welding Development Institute and NRC have continued their financial support for SRC's *welding technology assistance program.* This service provided expertise to improve welding and fabrication in Saskatchewan industry. The three-fold program encompassed advice on improving welding processes in manufacturing, failure analyses, and training of welding supervisors and managers. In 1979, this program handled 114 technical inquiries and produced 13 technical reports.

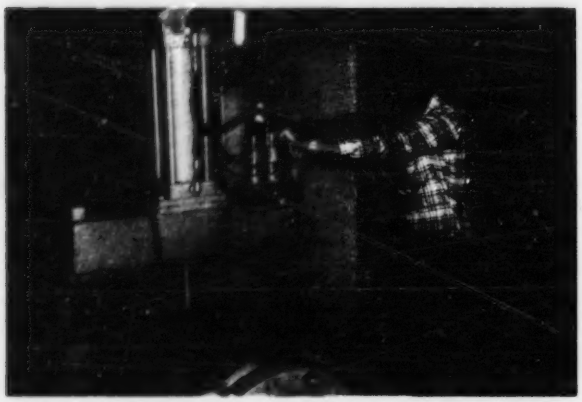
Grant Assistance

This year, SRC assisted 11 companies to obtain grants for a total of 1.3 million dollars. Several new programs were introduced including the Scientific and Technical Employment Program (STEP) administered by NRC.

Student Program

In Saskatchewan, under the Science Engineering Student Program (SESP), 12 students from engineering technology and engineering were employed with 10 different companies. Most of these firms were small, with fewer than 25 employees.

PHYSICAL PROCESS CONSULTATION



A large pinch valve was installed this year in the pipeline laboratory to regulate the flow of slurry through the 20" lines. SRC's slurry pipeline facility has earned international recognition as a centre of research into the transport of solid materials through pipelines.

Pipeline Transportation of Solid Materials

Water Slurry

Research has continued into the hydraulic transport of solids through pipelines. In this procedure, the raw materials were mixed with water, pumped through the lines as a slurry and then separated from the liquid at the terminal. In 1979, SRC completed a study of the transportation of coarse metallurgical coal through large pipelines for the Transportation Development Centre (TDC). Another contract involved experimental work on the hydraulic transport of zinc powder in a small diameter pipeline.

Coal-Oil Slurry

The flow properties of coal in oil slurries were measured by SRC scientists in a project sponsored by the federal Department of Energy, Mines and Resources (EMR). A vertical tube viscometer was produced by SRC staff to handle slurries containing large solids at high temperatures. Coal-oil slurries are being used as a fuel for thermal power stations to reduce oil consumption. This technology could be used to expedite feeding coal into high pressure gasifiers.

Utilizing of Wood Waste

Saskatchewan has a large supply of non-commercial wood that stands idle, is damaged or destroyed. In a project financed by the Department of Northern Saskatchewan (DNS), SRC examined methods for utilizing wood waste in the manufacture of insulating products. One result of this study was the recommendation that a modification of the Masonite process for treating wood at elevated pressures and temperatures could have potential for the production of a satisfactory insulating material.

Potash Research

"Creep Monitoring"

Stress cells developed over the last four years by SRC now are used in a majority of the potash mines in the province. These cells are used to monitor "creep" or the forces inside the potash pillars and help the mining engineer establish safer and more economic mining procedures. Such instruments can lead to marginal cost reductions that help to maintain Saskatchewan's position in the international potash market.

Laboratory Testing

There is a need for fundamental research into the structural behavior of potash ore to supplement the instrumentation developed for stress cells. To meet this need, the *Potash Creep Testing Laboratory* was commissioned by Saskatchewan's Department of Mineral Resources (DMR) and built under SRC supervision.

GRANTS-IN-AID FOR INDUSTRIALIZATION

SRC awarded grants-in-aid for several industrial research projects conducted at the Universities of Regina and Saskatchewan which are reported under "University Program". These studies dealt with:

- Entrepreneurship in the Prairie Provinces,
- Photovoltaic and Photoelectric Assisted Electrolysis of Water,
- Storage and Flow of Lignite Slurries,
- Housing Satisfaction.

ENVIRONMENT

INTRODUCTION

For over seven years, the environmental program has been concerned with the protection and improvement of Saskatchewan's air, water and land. Research has provided an understanding of how development practices may affect some of Saskatchewan's physical and biological environment. While economic survival necessitates development of resources, environmental research can provide a common sense balance between non-monetary costs and benefits. Multidisciplinary expertise at SRC has provided the province with a nucleus of specialists who are familiar with Saskatchewan's unique environmental requirements.

ENVIRONMENTAL ASSESSMENTS

This program was undertaken to provide a broad understanding of how present and future agricultural practices, resource extraction and industrial operations may affect the province's environment. The program also was designed to develop equipment, technical skills and consulting expertise in Saskatchewan to undertake environmental impact assessments for both the public and private sectors.

The acquisition of expertise to provide plant ecological and floristic studies has enhanced SRC's ability to undertake a full coordinating role within multidisciplinary environmental impact assessments.

Multidisciplinary Assessments

An example of the multidisciplinary approach involved the preparation of an environmental overview assessment for the expansion of the Potash Corporation of Saskatchewan's (PCS) facility at Lanigan. The study was coordinated by SRC's Engineering Division with input from the engineering, chemistry and biology, physics and geology divisions. Socio-economic studies were sub-contracted to the Institute for Northern Studies.

Research and Protection

Follow-up studies were undertaken to obtain much needed detail in areas identified as critical by environmental impact assessments and overviews. The most significant were archaeological and vegetation studies undertaken along the Key Lake access road as construction proceeds northward. This road passes through an area which has been relatively unknown both archaeologically and ecologically. SRC's investigations of the ancient campsites in this region have provided information about the prehistoric occupation of this region. Botanical investigations revealed the presence of several rare plant species and uncommon plant associations. This detailed study is expected to yield ecological data of significance for wildlife habitat assessment and for planning industrial activities in northern Saskatchewan.

Environmental research programs have been initiated where there is deficient background literature in areas of special concern. One area concerns bioaccumulation and movement through the eco-system of radio-nuclides generated by uranium mining operations. Studies have commenced to evaluate radionuclide uptake by fish.

Athabasca Sand Dunes

As mentioned in the Resource Development section of this annual report, a major multidisciplinary study is being undertaken to evaluate the effects of man-induced hydrologic changes in the Mackenzie River System on the stability of the Athabasca Sand Dunes, their flora and fauna.

SRC developed two battery-operated systems to provide on-going and efficient records of environmental data in remote locations. A prototype *robot hydrological monitor*

was developed to record measurement of water properties. In the second system, a *hydrometeorological* package was developed to transmit data by GOES (Geostationary Environmental Satellite) to NESS (National Environmental Satellite Service) in Washington. The data were retrieved through a computer-telephone system which used data-space allocated to Environment Canada's *Water Survey of Canada*.

AIR

Industrial Stack Sampling

Dust emissions from the stacks of potash plants are subject to provincial regulations.

A program was developed to offer a stack sampling service to Saskatchewan industry in order to insure that regulations were met. Representative sampling was conducted among ten mine sites to determine concentrations of emission to the air. This program provided benefit to the province from a reduction in nuisance and damage from salt dust emissions.

Industrial Emissions

In a study for the Saskatchewan Power Corporation (SPC), scientists investigated the air pollution control efficiency of a small power-generating facility. SRC studied the mass emission of tars, particulates and moisture.

Another part of this study involved a proposal to monitor some sulphur pollutants in northern Saskatchewan. Increasing industrialization has created higher ambient sulphur levels. An increasing acidity of water bodies has been responsible for a large amount of ecological damage in other countries. Since these influences are just starting in northern Canada, then a monitoring program could identify problem areas.

Agricultural Enclosures

Air Quality of Stables

Riding horses kept in large barns during the winter are vulnerable to respiratory disease because of the poor air quality within the confinement. In conjunction with the Western College of Veterinary Medicine (WCVM), SRC continued field work in a study of dust samples taken daily during a confinement period. Results indicated that the major contributors to contamination were indoor riding lessons, as well as daily feeding and bedding changes. This study is intended to identify the cause of coughing among stabled horses and enable corrective measures to be taken.

Dust Levels in Barns

The presence of hazardous dusts in turkey barns, particularly during the critical tom production period, adversely affects the quality of meat.

The air quality of typical barns has been examined in cooperation with WCVM. The results of this study indicate that the cause of respiratory disease in a turkey was unrelated to the type of particles inhaled but was provided strictly by the physical shape of the inhaled particles which penetrated into the birds' lung tissue.

Occupational Hazard Studies

Grain Dust Exposure

In collaboration with the University of Saskatchewan's (U of S) division of pulmonary medicine, SRC completed two years of site visits to obtain dust samples at country elevators. This study included 62 elevators of various storage capacities and 124 elevator agents of various ages and work histories. Some of the work areas surveyed exceeded the regulatory threshold value for total dust load. This study is intended to establish the hazards of grain dust to elevator operators and enable remedial action to be taken.

Dust in Machine Cabs

Following field samplings of dust in tractor and combine cabs, dust-chamber tests were conducted in collaboration with the U of S's agricultural engineering department. An operator's dust exposure was measured by placing a human dummy inside a farm tractor cab which was enclosed in a dust-chamber. The critical parameters which affected the resuspension of dust were the air flow pattern, cab pressurization, cab geometry, and general housekeeping of the cab.

Potash Mine Workers' Exposure

Although the airborne dust level is known to be extremely high at a borer site of an underground operation, little is known about the quantity of hazardous ingredients in this dust. A preliminary investigation was conducted in cooperation with the U of S's social and preventative medicine department to measure the content of respirable quartz and the fraction of water-soluble dust for an assessment of respiratory exposure.

WATER

Urban Runoff Measurement

Saskatchewan's growing economy has produced increased traffic with the necessity to move people and goods both quickly and safely. In 1969, when Saskatoon's first freeway underpass was built, consulting engineers were not able to obtain reliable rainfall data for high intensity storms. By next year, SRC will have collected enough rainfall data to aid city and highway engineers in the design of efficient, low cost drainage systems for highway underpasses.

New subdivisions have created another storm water management problem when their sewers were added to existing trunk sewers. New methods are required to prevent the new subdivisions from being flooded, and sewage being backed up into older houses by pressure on the combined stormwater sewer system. Eventual collapse of roads and storm sewers could result from this situation. SRC has been in contact with an engineering consultant, familiar with computer modelling, to provide synthetic storm hydrographs which can be used by city engineers to design street storm sewers.

Sewage Treatment by Aquatic Plants

Laboratory

Since 1976, growth chamber experiments have been undertaken to determine the efficiency of bulrushes and cattails in the removal of phosphorus and nitrogen from untreated sewage. Scientists studied the rate of nutrient removal and the feed value of the harvested plants. Currently, SRC has undertaken a study of the anatomical changes in the aquatic plants and their heat values in order to evaluate these plants as competitive sources of energy and as insulation material.

Humboldt Demonstration Project

The success of SRC's growth chamber experiments led to a large scale demonstration project in Humboldt. The purpose of this study was to evaluate the use of bulrushes and cattails in tertiary treatment of the effluent from small communities. A treatment system was constructed with three channels and two lagoons implanted with bulrushes and cattails. This joint project has been financed by several provincial, federal and private agencies including the Town of Humboldt.

LAND

Guidelines for Transportation Projects

Two reports were written to complete a multidisciplinary project initiated in 1977 to prepare guidelines for proponents of projects involving roads, highways, electrical transmission lines, oil and gas pipelines. The guidelines were developed to assist in the preparation of environmental impact assessments for submission to the Saskatchewan Department of Environment.

One report provided protection guidelines for all phases of transportation developments, from preliminary route selection to final abandonment. The other report provided detailed guidelines for an environmental impact assessment.

Once guidelines were completed for linear developments such as roads, transmission lines and pipelines, an audio-visual presentation was produced to inform government construction employees about environmental concerns associated with road building.

CLIMATE

Climatological Reference Station

This facility maintained a continuous record of baseline environmental data, and enabled weather information and advice to be provided to a variety of clients.

Weather Technology

A *Lightning Detection System* was implaced for the Department of Northern Saskatchewan (DNS). The equipment was designed for the identification of ignition strokes to facilitate early fire suppression and reduce destruction of resources.

SRC has developed models and tested modelling capacities for weather-sensitive processes. A project for SPC involved the modelling of heat loss from a water main.

Executive Director, Dr. T. P. Pepper discussed the treatment of raw sewage by aquatic plants with SRC project leader G. Lakshman at the Humboldt demonstration project.

Other experiments involved modelling of effluent dispersion from various mine sites and pollution associated with proposed new bridges.

Remote Sensing Technology has been explored for application to Saskatchewan's weather problems. Two workshops were presented in 1979, one dealt with remote sensing from airborne platforms and the second dealt with the remote sensing of weather phenomena by radar.

A guest speaker from the Atmospheric Sciences Division of the Alberta Research Council presented information at SRC's Weather Radar Seminar given in cooperation with the Saskatoon chapter of the Canadian Meteorological and Oceanographic Society.

GRANTS-IN-AID FOR ENVIRONMENTAL STUDIES

SRC supported a number of environmental oriented studies as reported in the section "University Program." These studies included work in:

- Land use in Northern Saskatchewan.
- Qu'Appelle River Sediments.

SERVICES

INTRODUCTION

Service work is an essential ingredient in the provision of high technology backup for a sophisticated research program. Specialized expertise is provided for SRC's projects and to outside clients on a contractual basis. These services are grouped under the headings: chemical analysis, graphics, workshops and special service facilities.

CHEMICAL ANALYSIS

Analytical and Radioanalytical Chemistry

There has been a large increase in the demand for analytical services this year, due to increases in mineral development and industrial activity. The main work areas continued to be water, trace metal and radiochemical analysis. The heavy demand in the water area has led to the purchase of a plasma-emission spectrometer, which can speed-up the analysis rate for water and metal samples.

As these services have expanded, staff members have been increased to a total of 18 in order to meet the demands of this higher volume.

The radiochemical analysis area experienced major growth this year with the workload approaching full capacity.

Geochemical Analysis Laboratory

This unit specializes in trace metal analysis in rock and ore samples collected from geological investigations in northern Saskatchewan. Major growth in 1979 occurred in the analysis of uranium ore specimens under contract with several provincial uranium mines.

Radiocarbon Dating Laboratory

Demand for this facility has increased every year since its inception. Nearly all of the analyses were supplied under contractual agreement. Clients included the Museum of Man, other federal departments, universities in western Canada, and other provincial research councils.

The main source of sample material was archaeological remains. SRC developed a new technique for the extraction of collagen from bones to speed-up sample preparation. This technique was designed not only to shorten the preparation time, but also to increase the accuracy of dating.

GRAPHICS

Geology Graphics Unit

SRC has undertaken a high degree of in-house training in this area due to the sophisticated nature of the technology employed. Senior staff have provided consultation services to assist in the upgrading of technology and acquisition of equipment. As well, staff members have served on advisory boards and committees established to upgrade the province's cartographic education and facilities.

The Geology Graphics unit's activities involve map cartography, photomosaics and the preparation of specialized brochures.

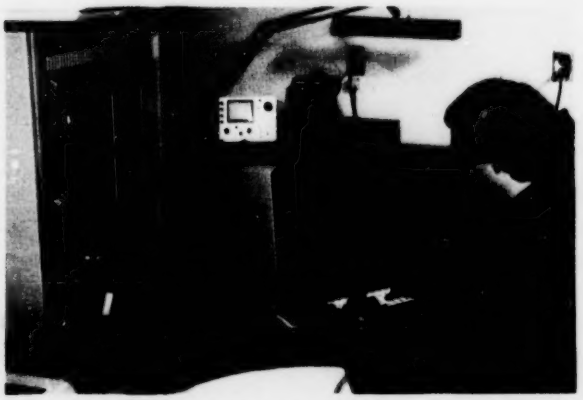
Work has started on a publication to outline the results of a multi-year study of Pleistocene geology in northern Saskatchewan. A major undertaking has commenced on a new series of groundwater and aquifer definition maps which were designed to up-date and complement the former series of geology and groundwater resource maps now nearing completion.

The unit continued to function as the coordination centre for air-borne remote sensing in Saskatchewan. In 1979, interpretation was provided for various clients, particularly in the potash industry. Low level aerial surveying has been available on a contractual basis through SRC's own flying service.

Instrumentation Graphics and Design

This group produced numerous graphs, figures, line-diagrams, photographs and slides under inter-divisional arrangements for special contract reports. Special visual materials were produced for SRC public information displays.

system was designed and developed to automate data gathering for SRC's Climatological Reference Station. Instrument servicing has continued to expand, with 30 contracts presently in force.



The Climatological Reference Station's record keeping system is being converted to a Microcomputer Implemented Data Acquisition System (MIDAS) for fully automated recording of baseline environmental data.

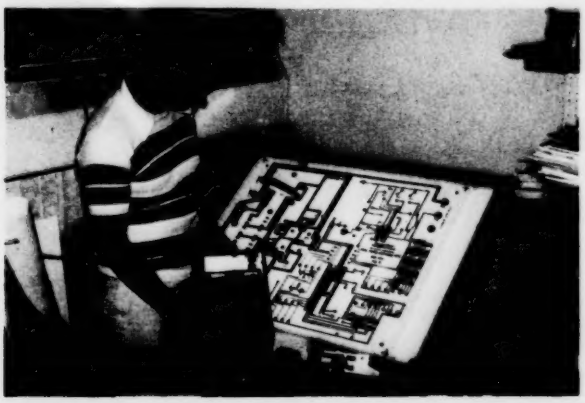
WORKSHOPS

Electronics Laboratory

This service has expanded its provision of contract work to a number of outside agencies in government, the academic sector and industry, in addition to the support operation for SRC's research program. Four specialized systems were produced for outside clients. In addition, two modules designed in 1975 were built this year for the Saskatchewan Power Corporation (SPC). A microcomputer

Precision Instrument Laboratory

This shop continued development, production and servicing of specialized scientific equipment. Metric conversion was completed on 57 previously-constructed water level recorders. Two valves for a gas chromatograph were developed for the federal government. A mold for a topographical map of Saskatchewan was produced for the Saskatchewan Department of Agriculture.



A long term integrator was designed, developed and produced by the Electronics Laboratory for the Saskatchewan Power Corporation.

The Precision Instrument Laboratory produces specialized scientific equipment whenever a particular device cannot be purchased for the required task.

SPECIAL SERVICE FACILITIES

Energy Conservation

SRC acted as project managers for the Saskatchewan Conservation House which has received excellent recognition for practical, home energy-conservation practices. SRC has continued to monitor the house's performance and to make various modifications as requested. The energy conservation achievements of this project have led to a backlog of enquiries to SRC from those who wish to utilize this knowledge. SRC's dissemination of free advice has produced an increased awareness of the value and practicality of various energy-saving approaches to home construction and renovation.

A four year contract has been completed for the Department of Northern Saskatchewan (DNS) to study the thermal behavior of water and sewer utilities at several northern town sites in the province. The results are to be used for information regarding optimal installation depths and insulation levels for such facilities.

A research contract has been undertaken for SPC on the implications of transporting power station cooling water by buried pipeline for distant heating purposes.

Department of Highways Test Track

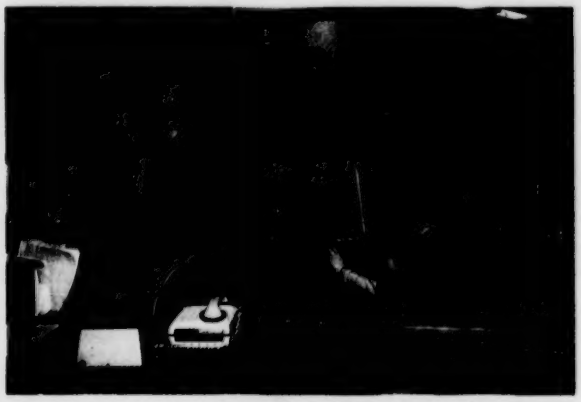
An indoor pavement test track, built under SRC's project management in 1978, is still the only one of its kind in Canada. This facility is beginning to play a significant part in the development of new road designs and is attracting favourable attention from across Canada and the U.S.A. SRC will continue to supply technical support for the facility over the next few years, to increase the versatility of this unique research tool.

Radiation Protection

The need to maintain a radiation safety monitoring program has developed as SRC has undertaken projects connected with uranium development. The program has been assigned to the electronics laboratory which has planned to offer industry, on a contractual basis, radiation and safety monitoring as well as instrumentation services.

Technical Library

This facility serves as a vital link between current projects and the world body of knowledge. SRC's library contains 12,000 reports and theses, 10,000 books and over 400 journals, abstracts and indices. An on-line information retrieval system provides access to over 150 data bases representing many areas of the sciences and technology. SRC consultants regularly use this service to reduce the cost of their consulting services.



The Technical Library's on-line retrieval system has been a valuable tool in providing updated data within a continuing information explosion.

GRANTS-IN-AID

SRC awarded a grant-in-aid to the University of Saskatchewan for the development of microprocessors for patient-monitoring aids as mentioned in the section under "University Program."

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RESEARCH COUNCIL

PUBLICATIONS

M121

IMPORTANT NOTE CONCERNING THE FOLLOWING PAGES

THE PAGES WHICH FOLLOW HAVE BEEN FILMED TWICE IN ORDER TO OBTAIN THE BEST REPRODUCTIVE QUALITY

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THE UNIVERSITY PROGRAM

SCHOLARSHIPS

The Government of the Province of Saskatchewan offers graduate research scholarships tenable at either the University of Saskatchewan or the University of Regina. The purposes of the awards are to assist graduate students to prepare for careers in scientific and industrial research, and to create interest in the exploitation of Saskatchewan's resources and in techniques that will advance the development of the Province. SRC conducts the selection of the candidates.

Awards valued at $5,000 for the year beginning October 1, 1979 were made to:

R. G. Kachanoski, Soil Science,
University of Saskatchewan

B. M. Olson, Soil Science,
University of Saskatchewan

J. G. T. Gerhart, Geography,
University of Regina.

GRANTS-IN-AID

Since its creation in 1947, the Saskatchewan Research Council has provided grants to applicants in Saskatchewan Universities for applied research in the sciences. Nineteen grants totalling approximately $92,000 were awarded in 1979 to applicants at both the University of Saskatchewan and the University of Regina.

The following projects presently are receiving support under the grants-in-aid program:

UNIVERSITY OF REGINA

DEPARTMENT OF BIOLOGY

The use of microwaves to control infestations of selected micro-organisms
under the direction of Professor D. R. Cullimore.
Phosphorus metabolism in high-protein, frost resistant potato hybrids
under the direction of Professor W. A. Quick.

DEPARTMENT OF INDUSTRIAL SYSTEMS, ENGINEERING

An empirical study of entrepreneurship in the Prairie Provinces
under the direction of Professor D. E. Shaw.
Work simplification in the mineral industry
under the direction of Professor D. S. Kochhar.

DEPARTMENT OF PHYSICS AND ASTRONOMY

Photovoltaic and photoelectric assisted electrolysis of water
under the direction of Professor J. F. Kos.

THE UNIVERSITY PROGRAM

SCHOLARSHIPS

The Government of the Province of Saskatchewan offers graduate research scholarships tenable at either the University of Saskatchewan or the University of Regina. The purposes of the awards are to assist graduate students to prepare for careers in scientific and industrial research, and to create interest in the exploitation of Saskatchewan's resources and in techniques that will advance the development of the Province. SRC conducts the selection of the candidates.

Awards valued at $5,000 for the year beginning October 1, 1979 were made to:

R. G. Kachanoski, Soil Science,
University of Saskatchewan

B. M. Olson, Soil Science,
University of Saskatchewan

J. G. T. Gerhart, Geography,
University of Regina.

GRANTS-IN-AID

Since its creation in 1947, the Saskatchewan Research Council has provided grants to applicants in Saskatchewan Universities for applied research in the sciences. Nineteen grants totalling approximately $92,000 were awarded in 1979 to applicants at both the University of Saskatchewan and the University of Regina.

The following projects presently are receiving support under the grants-in-aid program:

UNIVERSITY OF REGINA

DEPARTMENT OF BIOLOGY

The use of microwaves to control infestations of selected micro-organisms
under the direction of Professor D. R. Cullimore.
Phosphorus metabolism in high-protein, frost resistant potato hybrids
under the direction of Professor W. A. Quick.

DEPARTMENT OF INDUSTRIAL SYSTEMS, ENGINEERING

An empirical study of entrepreneurship in the Prairie Provinces
under the direction of Professor D. E. Shaw.
Work simplification in the mineral industry
under the direction of Professor D. S. Kochhar.

DEPARTMENT OF PHYSICS AND ASTRONOMY

Photovoltaic and photoelectric assisted electrolysis of water
under the direction of Professor J. F. Kos.

DEPARTMENT OF ANIMAL AND POULTRY SCIENCE

Effects of ammoniation on the composition and digestibility of several fibre components in cereal straws
under the direction of G. M. Horton.
Development of an electronic device for the easy monitoring of floor temperature in swine farrowing pens
under the direction of Professor R. Blair.

DEPARTMENT OF CHEMISTRY AND CHEMICAL ENGINEERING

Storage and flow of lignite slurries
under the direction of Professor C. A. Shook.
Liquid fuels from aspen, poplar and wheat straw
under the direction of Professors R. L. Eager, J. M. Pepper and J. F. Mathews.

DEPARTMENT OF CIVIL ENGINEERING

Disposal of uranium mill tailings
under the direction of Professor J. Krahn.

DEPARTMENT OF CROP SCIENCE

Digestibility studies on pea protein concentrate
under the direction of Professor R. S. Bhatty

DEPARTMENT OF GEOGRAPHY

Land use in Northern Saskatchewan
under the direction of Professor R. M. Bone.

DEPARTMENT OF GEOLOGICAL SCIENCES

Seismic mapping and fracture porosity estimates of granitic plutons in regards to storage of nuclear waste
under the direction of Professors M. Stauffer and Z. Hajnal.
Nature and physico-chemical properties of selected river and stream sediment in the Upper Qu'Appelle River Basin in Saskatchewan
under the direction of Professor P. M. Huang.

DEPARTMENT OF HOME ECONOMICS

Effect of alfalfa leaf fibre and saponins on hepatic sterol metabolism and on the fate and carcass distribution of cholesterol and bile acids
under the direction of Professor J. P. Olson.
Utilization of Saskatchewan cereals and legumes in baked, pasta and snack foods
under the direction of Professor A. K. Sumner.

DEPARTMENTS OF HORTICULTURAL SCIENCE AND MECHANICAL ENGINEERING

Utilization of stack gases from a coal-fired boiler for greenhouse vegetable production
under the direction of Professors E. A. Maginnes and G. H. Green.

DEPARTMENTS OF PHYSICS

Development of microprocessor-based systems for data acquisition, real-time processing and display in (a) intensive care hospital environment and (b) geophysical field operations
under the direction of Professor K. V. Paulson.

DEPARTMENT OF PSYCHOLOGY

Housing satisfaction
under the direction of Professor K. V. McDowell.

Copies of all papers published in the literature and of all theses resulting from grants-in-aid support by the Saskatchewan Research Council are available at the Saskatchewan Research Council library.

STAFF OF THE SASKATCHEWAN RESEARCH COUNCIL

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Kurucz, T.	B.A., M.B.A.
Levesque, R.	B.E., P.Eng. SMAILE
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Mullan, D.	H.N.C., C.Eng.
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Peters, M. L.	
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Rooke, P.	
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Wallace, K. W.	B.Sc.
Yoshida, K.	B.Sc., Ph.D.

SASKATCHEWAN RESEARCH COUNCIL FUND

FINANCIAL STATEMENTS

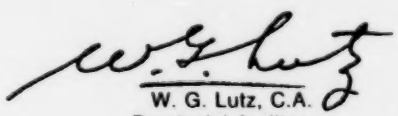
Year Ended March 31, 1979
OFFICE OF THE PROVINCIAL AUDITOR
REGINA, SASKATCHEWAN

AUDITOR'S REPORT

To the Members of the Legislative Assembly
of the Province of Saskatchewan:

I have examined the balance sheet of the Saskatchewan Research Council Fund as at March 31, 1979 and the statement of operation and balance of fund for the year then ended. My examination was made in accordance with generally accepted auditing standards, and accordingly included such tests and other procedures as I considered necessary in the circumstances.

In my opinion, these financial statements present fairly the financial position of the Fund as at March 31, 1979 and the results of its operations for the year then ended in accordance with generally accepted accounting principles applied on a basis consistent with that of the preceding year.



W. G. Lutz, C.A.
Provincial Auditor.

Regina, Saskatchewan,
June 22, 1979.

M121

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Statement 1

SASKATCHEWAN RESEARCH COUNCIL FUND

BALANCE SHEET

March 31, 1979
(with comparative figures at March 31, 1978)

ASSETS	1979	1978
Current:		
Cash in bank	$ 4,251	$ 18,760
Guaranteed savings deposit	15,715	12,537
Investments, at cost which approximates market value	30,000	160,000
Accounts receivable	744,590	925,655
Sharable costs recoverable (Note 2)	18,237	43,051
Prepaid expenses	23,271	17,684
Total current assets	836,064	1,177,687
Investments, at cost which approximates market value	20,000	20,000
Deferred finance changes	—	5,842
Investment in and advance to subsidiary (Note 4)	2,895	2,895
Equity in Saskatoon Co-operative Association	324	257
Fixed: at cost		
Laboratory equipment	1,108,443	1,012,004
Building	647,860	491,017
Automotive equipment	163,460	174,825
Furniture and fixtures	193,491	154,094
Shop equipment	97,026	63,138
Land	10,000	10,000
	2,220,280	1,905,078
	$3,079,563	$3,111,759

LIABILITIES	1979	1978
Current:		
Research grants payable	$ 54,301	$ 38,109
Accounts payable	59,374	266,711
Employee deductions payable	100,220	86,227
Loan payable — Minister of Finance (Note 5)	—	200,000
Principal portion of agreement payable	—	4,621
Deferred income	34,315	—
Total current liabilities	248,210	595,668
Agreement payable	—	27,358
Less portion shown as current liability	—	4,621
	—	22,737
EQUITY		
Equity in fixed assets (Schedule 2)	2,220,280	1,905,078
Balance of fund (Statement 2)	611,073	588,276
	2,831,353	2,493,354
	$3,079,563	$3,111,759

(See accompanying notes to the financial statements)

SASKATCHEWAN RESEARCH COUNCIL FUND

STATEMENT OF OPERATIONS AND BALANCE OF FUND

Year ended March 31, 1979
(with comparative figures for the 1978 year)

	1979	1978
Revenue		
Province of Saskatchewan — grant	$2,517,950	$2,575,350
Others grants, contracts and fees from industry	2,629,924	2,310,457
	5,147,874	4,885,807
Expenditure (Schedule 1)	5,108,914	4,876,996
Excess of revenue over expenditure before the following:	38,960	8,811
Other income	52,738	55,522
	91,698	64,333
Research grants	68,901	86,618
Excess of revenue over expenditure (expenditure over revenue) for the year	22,797	(22,285)
Balance of fund, beginning of year	588,276	610,561
Balance of fund, end of year (Statement 1)	$ 611,073	$ 588,276

(See accompanying notes to the financial statements)

Statement 1

SASKATCHEWAN RESEARCH COUNCIL FUND

BALANCE SHEET

March 31, 1979
(with comparative figures at March 31, 1978)

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SASKATCHEWAN RESEARCH COUNCIL FUND

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(with comparative figures for the 1978 year)

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Balance of fund, end of year (Statement 1)	$ 611,073	$ 588,276

(See accompanying notes to the financial statements)

Schedule 1

SASKATCHEWAN RESEARCH COUNCIL FUND

SCHEDULE OF EXPENDITURES

Year Ended March 31, 1979
(with comparative figures for the 1978 year)

	Admin.	Chem.	Eng.	Geology	Indus. Services	Physics	1979 Total	1978 Total
Employee benefits	$ 79,437	$ 44,355	$ 70,608	$ 40,547	$ 26,523	$ 46,090	$ 307,560	$ 259,374
Fixed asset purchases	191,958	81,442	82,831	18,304	11,385	25,111	411,031	640,548
Other	161,282	35,142	79,381	136,779	27,123	17,244	456,951	424,450
Salaries	299,088	622,644	742,525	521,370	340,582	449,619	2,975,828	2,435,198
Supplies	34,517	82,799	126,577	62,076	46,944	43,317	396,230	439,585
Technical services	84,667	49,515	31,175	103,603	62,166	36,357	367,483	518,852
Travel and vehicle operations	19,431	31,194	32,878	46,757	36,394	27,177	193,831	158,989
	$870,380	$947,091	$1,165,975	$929,436	$551,117	$644,915	$5,108,914	$4,876,996

(See accompanying notes to the financial statements)

Schedule 2

SASKATCHEWAN RESEARCH COUNCIL FUND

SCHEDULE OF EQUITY IN FIXED ASSETS

Year Ended March 31, 1979
(with comparative figures for the 1978 year)

	1979	1978
Equity in fixed assets, beginning of year	$1,905,078	$1,336,464
Add: Fixed assets additions (Schedule 1)	411,031	640,548
	2,316,109	1,977,012
Deduct: Fixed asset disposals		
— written off (Note 1)	86,226	47,351
— sold	9,603	24,583
Equity in fixed assets, end of year	$2,220,280	$1,905,078

(See accompanying notes to the financial statements)

Schedule 1

SASKATCHEWAN RESEARCH COUNCIL FUND

SCHEDULE OF EXPENDITURES

Year Ended March 31, 1979
(with comparative figures for the 1978 year)

	Admin.	Chem.	Eng.	Geology	Indus. Services	Physics	1979 Total	1978 Total
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Travel and vehicle operations	19,431	31,194	32,878	46,757	36,394	27,177	193,831	158,989
	$870,380	$947,091	$1,165,975	$929,436	$551,117	$644,915	$5,108,914	$4,876,996

(See accompanying notes to the financial statements)

Schedule 2

SASKATCHEWAN RESEARCH COUNCIL FUND

SCHEDULE OF EQUITY IN FIXED ASSETS

Year Ended March 31, 1979
(with comparative figures for the 1978 year)

	1979	1978
Equity in fixed assets, beginning of year	$1,905,078	$1,336,464
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	2,316,109	1,977,012
Deduct: Fixed asset disposals		
— written off (Note 1)	86,226	47,351
— sold	9,603	24,583
Equity in fixed assets, end of year	$2,220,280	$1,905,078

(See accompanying notes to the financial statements)

SASKATCHEWAN RESEARCH COUNCIL FUND

NOTES TO FINANCIAL STATEMENTS

March 31, 1979

1. **Accounting Policies**

   (a) Fixed Assets

   (i) The Saskatchewan Research Council utilizes fund accounting wherein all receipts and expenditures including those for fixed assets appear in the statement of revenue and expenditure. To maintain accountability for fixed assets, it is necessary to record them as a balance sheet asset with a corresponding entry to "Equity in Fixed Assets". Because asset purchases and sales appear in the statement of revenue and expenditure, no provision has been made for depreciation of fixed assets.

   (ii) The Council's policy is to remove the cost of all equipment from the accounts which have:

   — become obsolete during the year
   — been sold during the year
   — been in service for ten years.

   (b) Principles of Consolidation

   The Council's subsidiary does not follow fund accounting practices adheared to by the Council. As a result of the incompatibility of accounting practices the accounts of the subsidiary are not consolidated with those of the Council but are accounted for by the equity method.

2. **Shareable Costs Recoverable**

   Under the terms of an agreement, which expired in December, 1978, with the Federal Government Agency administering The Agricultural Rehabilitation Development Act, the Council is allowed to recover from the Agency one half of all eligible expenditures it has incurred on the Ground Water Study.

   As at March 31, 1979 the Council had received all but $18,237 of the total expenditures claimed for the final term of the agreement.

3. **Unfunded Liability**

   An actuarial valuation of the pension plan of the employees of the Saskatchewan Research Council as at December 31, 1977 revealed an unfunded liability of $1,105,418 and an experience deficiency of $211,780. Subsequent to the release of this valuation, the Council and the employees covered by the plan approved a change in the benefits payable under the plan retroactive to January 1, 1978. As the result of the changes in the benefits payable, there is no longer an experience deficiency and the unfunded liability as at December 31, 1977 is $403,559. These past service costs will be funded over a period of fifteen years at an annual rate determined by the actuary to be $42,532 commencing in 1979. An initial unfunded liability of $88,613 for past service costs at the outset of the plan as at May 1, 1974 is being funded at a rate of $8,861 over a fifteen year period which commenced in 1975. The Council feels that these are reasonable periods over which to charge these costs to operations.

4. **Investment in Subsidiary**

   The Council's subsidiary was incorporated under the Companies Act of Saskatchewan on December 3, 1976 and has been inactive since that date.

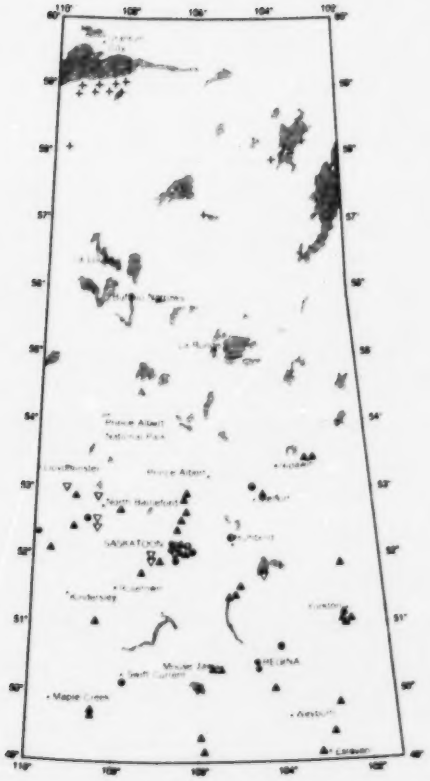
5. **Repayment of Loan — Province of Saskatchewan**

   The balance of the loan payable to the Minister of Finance as at March 31, 1978 was repaid in full in the current year.

6. **Comparative Figures**

   Certain of the 1978 figures have been reclassified in order to make the financial statements comparable to 1979.

LOCATION OF SASKATCHEWAN RESEARCH COUNCIL FACILITIES



EXPLANATION

- ▲ Observation well
- ● Sewage treatment
- ● Pesticide sampling site
- ● Spray freezing site
- ● Slough study
- + Sand dune studies
- ▽ Watershed